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Recycling and its Role in Reducing Costs and Achieving Sustainability

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Abstract. Although the recycling of industrial waste leads to achieving sustainable development of reducing the use of materials from nature, also ridding the environment of harmful waste, the controversy still exists regarding the economics of this process. After the first and second world wars, the idea of recycling began, where countries were suffering from a severe shortage of some basic materials. This encouraged her to recycle the waste and use it again. As a result of the increased consumption of resources, it is necessary to find alternatives characterized by quality, as well as being of lower cost and achieving sustainability. So, the following questions will be discussed to reduce costs and achieve sustainability, Does the waste recycling process achieve cost reduction? Does the waste recycling process achieve environmental improvement through cleaner production and sustainability? Among the most important of these alternatives are reused of waste and how to reduce the cost of recycling and benefit from it in achieve environmental efficiency for products. The waste recycling process achieves a reduction in production costs, the process of waste recycling achieves environmental improvement and sustainability. As waste is characterized as inexhaustible because a person cannot stop consuming. The research aims to achieve reducing the cost of waste recycling in industrial companies and achieving sustainability for the purpose of achieving environmental efficiency for industrial products as a result of technological change and the use of waste recycling by reducing production costs as well as using statistical analysis through questionnaires distributed to specialists in universities, laboratories and Environmental department to reach results that can be benefited from environmental improvement by reducing the cost of recycling waste as an economic resource and achieving cleaner production to produce environmentally friendly products. The results of the research were analyzed using the (SPSS) statistical program, where the results of the research indicated a cost reduction and thus achieving sustainability by preserving the environment as a result of producing environmentally friendly products. The most important recommendations were to recycle waste as an alternative energy, as it contributes to improving the environmental efficiency of products, reducing costs, achieving cleaner production and environmental improvement. It also contributes to the process of disposing of toxic waste in a healthy manner at a lower cost and achieving economic returns, as well as helping to provide job opportunities and reduce the unemployment rate.

Keywords. Recycling, Cost Reduction, and Sustainable Development.

INTRODUCTION

The history of recycling goes back thousands of years, and this concept may seem like one of the modern concepts that were associated with movements calling for the preservation of the environment in the seventies of the twentieth century, but in fact it has been used some individuals in some way thousands of years ago. Recycling can be defined: it is the collection of used materials, then converting them into raw materials, and then re-producing them to become consumable materials again, and the concept of recycling can include anything old that can be used again, in other words, it is a process through which the use of Invalid materials that are considered waste and introduced into new production and manufacturing processes. Waste in its general form, whether resulting from production processes or as a result of human consumption, is harmful waste that leads to harm to the environment and society. Because of the lack of resources, going to the process of recycling waste starts from collecting and sorting waste, each according to its type. Here the need arose to find ways to dispose of waste while making use of it, so the countries of the world turned not only to recycling, but to using the remaining waste, which they cannot recycle due to material or industrial capabilities, so they use it as a cheap alternative to energy. "Human activity causes damage to the natural environment, and most people witness environmental pollution, so it appears as an open place for waste or in the form of black smoke emitted from a factory, but the pollution may be invisible and

without smell or taste”. What concerns us in this regard is the pollution resulting from waste and how to recycle is lower cost and sustainable. Although waste represents most obvious form of pollution, because every year people throw billions of tons of waste, industrial waste is the largest share of this waste. Waste from homes, offices and stores is called municipal waste. And it includes (paper, plastic, bottles, cans, food waste, garden waste, and other wastes include scrap cars, metals, agricultural operations and mining waste). Waste to be expelled by homes and factories was perhaps the most obvious cause of pollution, and many societies used to bury waste in large areas called landfills. Waste handling is a problem in itself because most waste disposal methods destroy the environment. After several years of World War II, the focus was on the direct recycling process by waste (scrap) producers. But after the nineties, the focus began on the indirect recycling process, which means using waste materials to produce other products, such as the process of recycling glass, paper, plastic, aluminum and others.

RESEARCH PROBLEM

Problem of the research lies in the weak interest of the industrial sector in Iraq towards continuous improvement in production processes through the use of technological change and the search for ways and alternatives with lower costs to achieve economic efficiency and preserve natural resources , in addition to the increase in human consumption and increase in production processes with which the amount of waste increased, which is Harmful wastes that harm health, the economy, the environment and society, and that the problem of disposal of these wastes has become a problem of the times.

AIM OF THE RESEARCH

This research aims to use waste recycling as an alternative energy and an alternative raw material (technological change), which achieves cost reduction as well as environmental improvement through cleaner production and sustainability.

RESEARCH IMPORTANCE

The importance of the research lies in improving production efficiency by using technological change in the treatment of waste to become alternative energy or alternative raw materials and considering it a resource of natural resources to achieve sustainability in order to achieve Reducing in production costs, Environmental improvement through cleaner production, Achieving sustainable development.

RESEARCH HYPOTHESIS

The research includes a main hypothesis that recycling waste leads to reducing costs and achieving sustainability, from which the following hypotheses are branched.

RECYCLING WASTE AND ITS ROLE IN REDUCING COSTS AND PRESERVING THE ENVIRONMENT

Technological change, including either the production of a new type of commodity or the modernization of the method of production. And here in this topic, what is meant by technological change is to replace part of the production stages by introducing the method of recycling waste, thus achieving cleaner production, that technological developments and changes are the main engine of growth and then economic development, and technological change is the backbone and the main axis for achieving economic development, both at the level. The economic unit or at the level of the state as a whole, so the use of technology in industrial companies has a major

role in achieving sustainable development by reducing the consumption of energy and natural resources and reducing costs.

History of Recycling

The concept of recycling has emerged in the thirties and forties of the twentieth century as one of the important concepts in many countries of the world due to the economic depression that occurred at that time, and some materials were being recycled Such as nylon, rubber, and metal. The popularity of the use of this concept declined in the United States of America as a result of economic growth, and this decline continued until the end of the sixties and the beginning of the seventies of the twentieth century until the concept of recycling was proposed on the first Earth Day in 1970 AD, then its use continued to increase steadily with the passage of time, and it should be noted That there are many things that can increase the success and spread of this process Such as the laws binding on this matter and the general acceptance of it by individuals and their cooperation to make it successful.

Benefits of the Recycling Process

There are many benefits that highlight the importance of the recycling process, including the following:
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- Save trees: 13 trees can be saved from being cut down by recycling one ton of paper — the equivalent of 40,000 sheets of A4 paper — and paper recycling can save 2.5 barrels of fuel and 4 m³ of landfill space needed It also saves about 4,100 kilowatts of electrical energy, as well as saving 31,780 liters of water.
- Reducing landfill space: Recycling reduces the waste that must be sent to landfill, creating additional landfill space.
- Providing new job opportunities: Recycling is an important tributary to creating new job opportunities. For example, in California, this process provides approximately 85,000 jobs at the state level, so it is considered a major business there, in addition to achieving financial revenues in the state amounting to 10 billion dollars that vary in size. Between products and services.
- Reducing energy consumption: The recycling process is an important matter that has a significant impact on saving the amounts of energy consumed by new industries; For example, glass manufacturers can operate manufacturing furnaces at lower temperatures if they use recycled materials, which saves 40% of energy, and 95% of the amount of energy needed to produce an aluminum can be saved when using recycled materials compared to making it from Raw materials, 60% of the energy needed for metal production, 70% of energy for plastic production, and 40% of energy for newspaper production.
- Conservation of Natural Resources: Recycling processes preserve natural resources and protect them from excessive consumption, as it reduces the quantities of raw materials required by various industries, and these raw materials — whose use is rationed through recycling — reduce the need to extract new raw materials from the ground, and reduce many the harmful matters associated with it, such as deforestation and mining, also provide areas of land for waste disposal.
- Reducing greenhouse gas emissions: Recycling materials reduces the amount of greenhouse gases emitted from the use of some materials in manufacturing processes; Such as coal and gas, and its proportions can be reduced by reducing the production of methane gas resulting from the decomposition of waste in landfills, and by avoiding the use of raw materials in the manufacture of new materials, which increases the proportion of carbon dioxide produced from the manufacturing process compared to recycled materials.

Types of Recycling

Recycling includes two main types. They are internal recycling and external recycling, and the following is a brief explanation of each type:

- 1- Internal recycling: Internal recycling operations depend on the principle of renewing the use of materials resulting from the remnants of manufacturing processes, and this type is common in various metal industry. Melt it and turn it into a new product.
- 2- External recycling: External recycling is concerned with collecting used, worn out and old materials and then using them to produce new goods, such as the process of assembling old magazines and newspapers, then using them in the manufacture of new paper products, and other examples are collecting old glass materials and converting them into new ones, and there are many ways that can be. By obtaining used and old materials to be recycled through this method, these materials can be obtained through some special places that buy these old and worn out materials and then sell them, and they can also be obtained for free through collection centers for recyclable materials, or through Collect it from the trash cans on the roads.

Materials that Can be Recycled

Recycling processes include many different materials such as iron and steel, glass, aluminum cans, wood, paper and other materials; the process of recycling these materials reduces the depletion of many resources from nature; Such as petroleum, natural gas, trees, coal, and mineral ores.

- Metals: There are many metals that can be recycled, including the following: Aluminum cans Aluminum cans are a completely recyclable material, meaning that old cans can be converted into completely new cans.
- Aluminum foil: Aluminum foil is used in many different industries, such as those that are used to wrap foods, or those that are placed on the stove to keep it clean, and many other uses.
- Tin cans and steel cans: The process of recycling tins cans and steel cans is done by entering them into special furnaces, and the recycled cans can be mixed with new steel cans.
- Steel Leftovers from old cars and buildings are the mainstay of recycled steel.
- Plastic: The disposal of plastic is a serious problem; because it consists of materials that are not degradable with the passage of time; it consists of chains of complex molecules, and the cost of producing plastic is low. <https://mawdoo3.com>.
- Paper: The importance of paper recycling is to reduce energy use, maintain a clean environment, and preserve its various resources such as water and trees, as the traditional paper industry is based on the use of trees as an essential element of the industry process.
- Glass: The glass recycling process can be done in two ways, they are collecting, washing and sterilizing the glass, before reusing it again, without any manufacturing operations occurring on it.
- Gathering the glass and sorting it according to its color into groups: then crushing and grinding it into small parts through a special machine, then filtering it from any other materials stuck to it, then melting it and forming it again into new glass.
- Electronic devices Recycling: electronic devices is not popular as is the case with other goods, as electronic devices contain many pieces that may contain toxic substances such as mercury, lead, and others, so the process of recycling them needs people specialized in this work.
- Other materials: The idea of recycling things lies in looking for a useful use for them before getting rid of them or throwing them, for example, rubber tires can be used as insulator, and organic waste can be converted into fertilizers, and old blankets and clothes can be recycled by collecting and distributing them to a charitable organization to be disposed of. Distribute it to the needy.

MATERIALS AND METHODS

Solid Waste Management

Solid waste management aims to deal with health, environment, lands used, and resources, and to deal with economic concerns related to the proper disposal of waste. Population growth, continuous civilized development and the rise in the standard of living have greatly accelerated the increase in solid waste in developing countries, and they are unable to keep pace with this growth, and they are still using the same old methods of waste disposal (landfill)". (1). Waste management is the collection, transportation, and disposal of garbage, sewage and other waste products. Waste management includes managing all resource processes in order to properly deal with waste materials, starting from the maintenance of waste transport trucks to landfills, which comply with the health conditions of environmental regulations". (6). Waste collection costs represent the largest proportion in the total costs of the waste management system, so the cost savings must initially present. Collection costs, especially with the management's weakness in controlling the rest of the costs, and therefore any modification to the collection and transportation system or its improvement. That is, improving the transmission network Waste, for example, determining the best route for a waste collection vehicle will have a direct economic impact on the overall costs. Usually there are three types of fees or costs in the different collection, storage, transportation, treatment and final disposal of solid waste. As follows:

- Users' fees are based on the weight or volume of waste disposed.
- Fees and costs of treatments and waste disposal in technologies and sanitary landfills.
- Production costs represented in constructing containers, packages, and bags, operating costs, and transportation mechanisms.

The cumulative costs spent on all stages and methods of solid waste treatment, represented by the financial and human resources used in the proposed sorting processes and up to the final disposal. As for the social costs or the external costs, they are the costs of the negative environmental impacts borne by the community, which result from the depreciation of the natural resource and resulting from pollution associated with environmental damage, such as groundwater pollution and air pollution. Solid waste and the cost of depreciating the value of the land that is used as a landfill as an example. External costs are taken into account in the accounts and added to the total costs of waste management operations. (20: 28).

Recycling and Technological Change

Technological Change

Use of technological change is one of the indicators that reduce the environmental impacts resulting from operations, production outputs, first through the efficiency of use (inputs — outputs) by using less polluting technology, secondly by substituting less polluting inputs using technological change or by replacing production processes with environmentally cleaner alternatives, and can be defined technology change. is a process that includes three basic stages: invention, innovation, and dissemination, and this is done by several people, including users, producers, processors and decision makers. It can also be defined as new processes, policies, technologies, systems or products to avoid or reduce negative environmental impact and includes all changes in the product, or production processes that affect sustainability such as waste management, environmental efficiency, reduction of harmful gases, and recycling, i.e., all continuous improvements in activities that affect the environment. (8: 615). Understanding of the process of technological change is important for two reasons, the first is that the environmental impact on social and economic activity is greatly affected by the speed and direction of technological change. New

technology may create or increase polluting activities. Moreover, many environmental problems and policies are evaluated and studied over time periods to determine the extent Effects and uncertainty about these policies and future technological changes to reduce future environmental problems and to know the extent of improvement required in them to avoid these problems, for example, improvements in energy efficiency in terms of cost to achieve certain policy goals, secondly, environmental policy inputs create new obstacles and incentives that affect the process of. Technological and can have important consequences in terms of cost-benefit analysis or cost-effectiveness, and they may have a broader analysis such as social analysis, the process of technological change is characterized as being affected by the external market. And associated environmental issues. (9:463).

Waste today is a source of income for many countries in the world through recycling operations, and recycling is the third element in the waste hierarchy. The hierarchy categorizes waste management options according to what is best for the environment, as it gives the highest priority to prevention in the first place, and when waste is generated, it gives priority to preparing waste for reuse, then recycling, then recovery (reform), and the last is waste disposal (landfill) ”. (5:2-3). As the following figure:

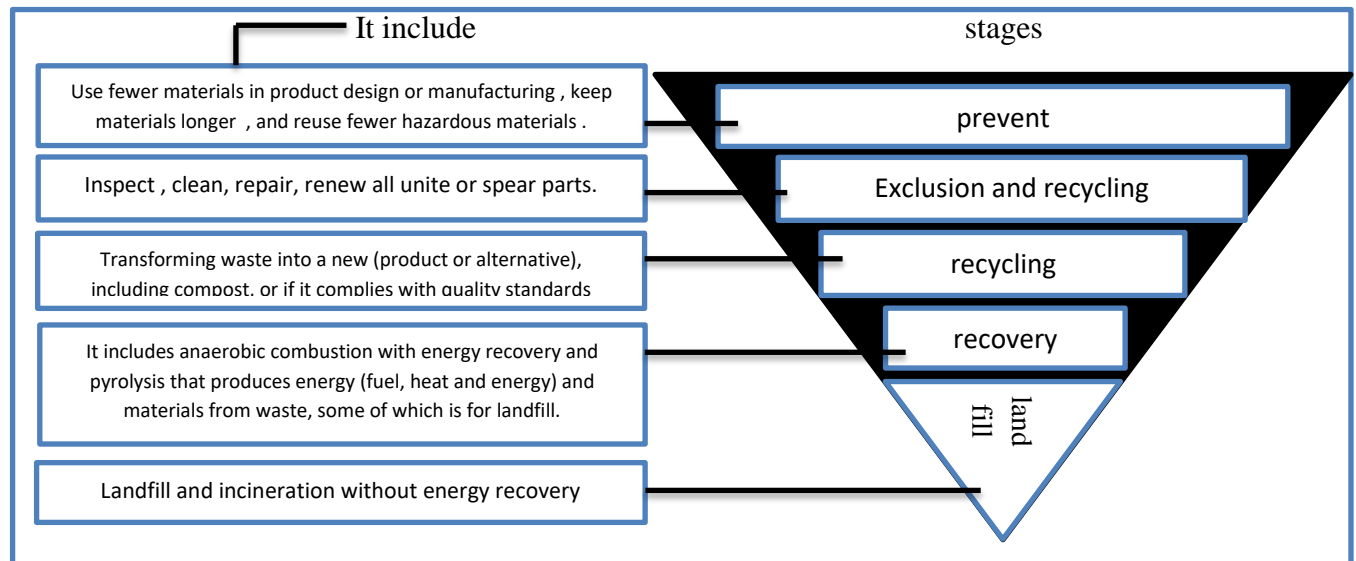


FIGURE 1. Shows the Elements of the Waste Hierarchy. Source : Author preparation

Recycling

Is the process of converting waste into usable products to prevent waste in useful materials and reduce the consumption of primary raw materials, the use of energy and air and water pollution by reducing the need to the least possible to reduce greenhouse gas emissions and recycling is the third element in the waste hierarchy, In the next figure the international mark to indicate the recycling process of the product.

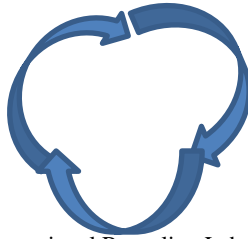


FIGURE 2. International Recycling Label . source : Author preparation

Recycling process includes the treatment of waste so that it can be used as raw materials in the same process that generates it or in other processes. Currently, recycling is one of the best alternatives to waste management. Waste recycling depends on the economic feasibility of these processes and on the demand for different products. (Paper, glass, bone, cloth, plastic, metallic waste, and organic waste. (10:98).

Recycling is: the collection of waste materials, and the process or recycling of them into either (biological, mechanical, chemical or thermal) into new products and marketing of these products. (12:1-3).

The Benefit or Purpose of Recycling: (EPA, 2015: 1)

- Reducing amount of waste sent to landfill or incineration.
- Natural resources such as wood, water and minerals must be preserved.
- Helps to find good-income jobs in the field of recycling and manufacturing.
- Energy saving.
- Greenhouse gas emissions that contribute to global climate change must be reduced.
- Helping preserve the environment for future generations.
- Helping to create new job opportunities for community members in the field of manufacturing and recycling

Waste Treatment Methods in the Developed World

The process of waste disposal has become a source of concern in industrialized countries with high population density and technological progress. Therefore, these countries have created safer ways to dispose of waste, as some of them cause health and environmental risks. Therefore, some countries have developed laws and regulations for disposal methods. These methods are" : (20: 34).

- 1- Incineration: waste is incinerated for the purpose of converting it into energy, resulting in gases and ash, and filters are placed to reduce pollution operations, and it is considered less costly than other waste recycling operations.
- 2- Sanitary landfill: Waste that cannot be recycled is disposed of by landfill using modern methods, where a protected lining is placed under the waste to prevent harmful chemicals from leaking into the groundwater and covered with sand or building materials such as cement or asphalt to seal each layer from the other to prevent Leakage is usually in lands outside residential areas.
- 3- Recycling: It is one of the well-known methods and it is not very expensive, especially as it will save energy and sources of raw materials and then reduce pollution and can save money. Among the materials that can be recycled: (paper, glass, aluminum and plastic) and most developed countries Encourage residents to recycle by providing tools and places for sorting.
- 4- Decomposition: It is a natural process devoid of any dangerous secondary materials. This process includes breaking the materials into organic compounds so that they can be used later as fertilizer after leaving these organic materials to decompose for several months.

- 5- Gaseous plasma conversion: It is one of the methods of treating solid waste, including hazardous waste, and has the ability to recover energy. Through the process of gaseous plasma conversion, the organic decomposition of solid raw materials is transformed into gaseous materials with a high calorific value that are used as fuel or chemicals and non-metal materials. The organic hardens and turns into non-washable materials that can be safely disposed of or reused as a building material.

There are Three Main Recycling Processes

- 1- Collection and processing: The recycling cycle begins with the process of collection and collection of recyclable materials varies from one community to another, but there are five basic methods, which are collection on the pre-sorted sidewalk, collection on the unsorted sidewalk, collection centers, buy-back centers and deposit and financing programs , When separating recyclable materials, this is called (pre-recycling) and when the waste collector separates them from dirt, this is called (unsorted).
- 2- Manufacturing: Regardless of how recyclable materials are collected, the post-assembly stages are the same. Recyclable materials are delivered to material recovery centers for processing and preparation, and then marketed for production. Recyclable materials are bought and sold as any commodity, and their prices are affected and change according to the market situation. After cleaning and sorting, the materials are ready for the next stage of the recycling cycle.
- 3- Purchasing recycled products: Purchasing recycled products completes the recycling cycle by purchasing recycled materials. Government agencies, as they are in consumer companies and individuals, play an important role in the success of the recycling process. As consumers demand more environmentally friendly products, manufacturers will keep trying to meet these demands by producing new, high quality recycled products.

Economic Advantages of Waste Recycling Projects

Among the advantages that make waste recycling projects capable of expanding economic opportunities for young people, are the following: (15: 480).

- 1- Investment in such projects does not require large capital; It provides great opportunities for young people with small savings to invest in.
- 2- The main resource for recycling projects is (garbage), and it is known that all people dispose of it and throw it away, and from here young people can obtain this resource for free, without the need for procedures to own or buy it.
- 3- Recycling technology is easy to train in its use, can be learned on the job, and can be used by young people who have been deprived of education.
- 4- Specific and inexpensive machines can be used in recycling technology, which helps young people to obtain them without incurring large costs.
- 5- Finally, young people will turn to recycling projects, when they realize their importance to protecting the environment, as they are always keen to have a positive role in serving their communities.

Kaizen Target Cost and its Role in Cost Reduction

- 1- **Kaizen Target Cost:** Kaizen cost can be described as continuous improvement applied to the production stages of the product in order to achieve cost reduction, and it reduces production costs by searching for alternatives to increase efficiency in production processes. Kaizen is to eliminate all inactive elements in the production process. (4: 222). The use of kaizen is easy and simple, and it is related to continuous improvement by involving all those who are in the economic unit, starting from the administration and workers, from the highest person to the lowest worker in it, provided that he adheres to the work plan, which must be easy, simple and low in cost, and it usually includes innovation, maintenance, and improvement. Continuous in management standards that the kaizen cost system provides data to support the lean production system, as it focuses on reducing costs during the product manufacturing stage, and the meaning of the word kaizen in the Japanese term is the continuous improvement of the production process in small and gradual quantities and not through large innovations and during a short or specific period. (19: 273).
- 2- **Kaizen cost concept:** The concept of kaizen cost is the small and continuous improvement of the cost of the product during the manufacturing stages to reach the lowest possible price based on: (20: 48).
 - A. Assuming continuous improvement in manufacturing processes.
 - B. Achieving cost-reduction standards and reaching the lowest possible cost.
 - C. A gradual approach and continuous improvement of the production stages and thus a continuous reduction to reach a product that matches customer satisfaction in terms of quality, effectiveness and price in order to compete effectively.
- 3- **Kaizen cost techniques:** (20: 49).
 - A. Comparing the target costs with the actual, analyzing the variance and sharing the responsibility with the production workers, as they are the most aware of the improvement processes and their strengths and weaknesses.
 - B. The use of several tools that lead to the removal of waste and damage, the most important of these tools are (plans - work - make sure - and act) and (five S) which are (sorting, arranging, clarification, systematization, and unification).
 - C. Endless improvements in the production processes of the product that is still in the production stage (using the standard limit for raw materials, reducing indirect costs, negotiating with suppliers to obtain the lowest prices. The basic idea is the continuous reduction of additional costs and on the basis of the product life cycle, and the next figure shows the stages of inclusion of kaizen cost in the economic unit: (3:116).

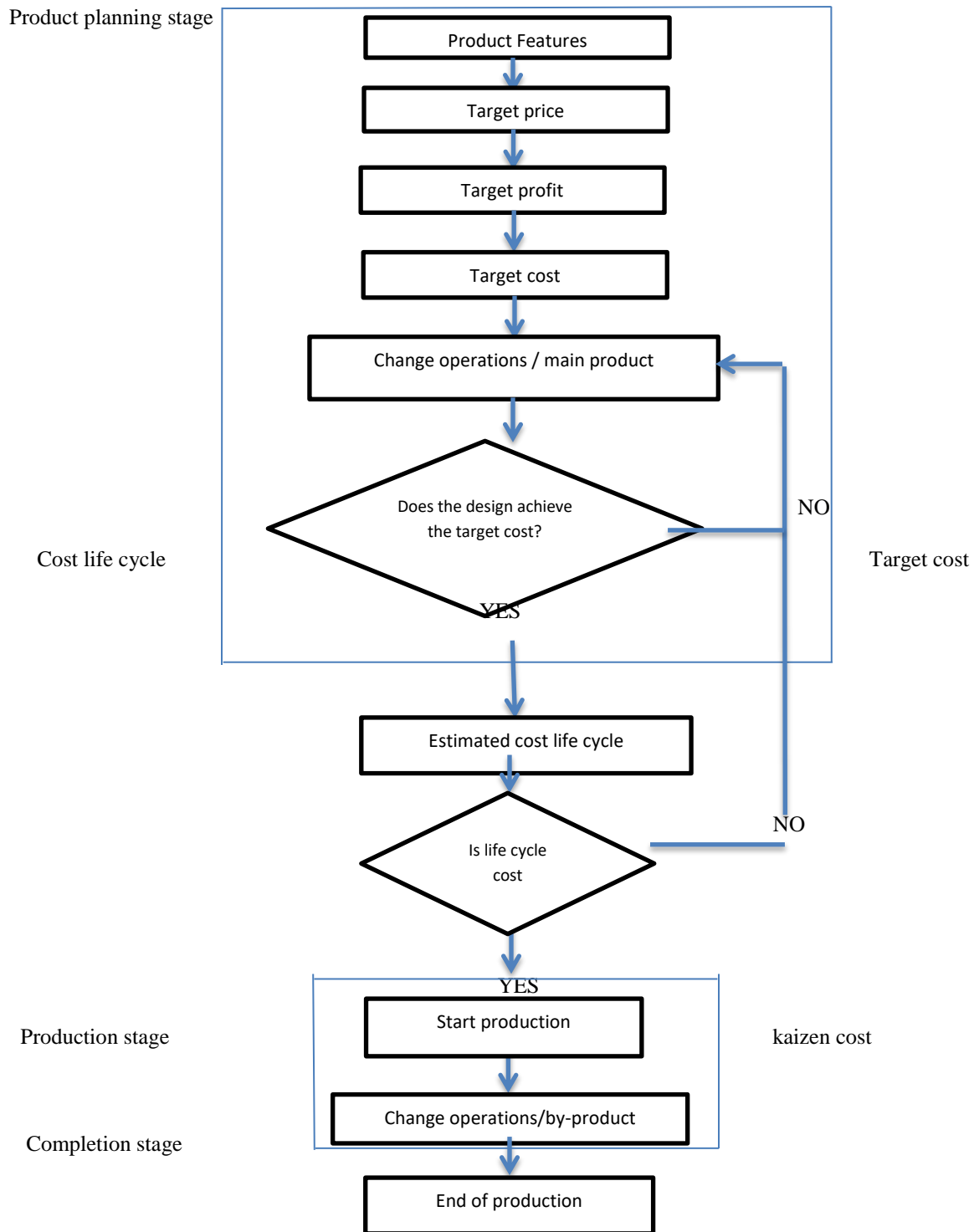


FIGURE 3. Stages of Inclusion of the Cost of Kaizen Source: Author preparation

Kaizen cost activities is to focus on continuous little and incremental improvement of the cost of the product in the manufacturing stage, as opposed to continuous improvement in the design and development stage of the product.

- Kaizen cost and target cost: The cost of kaizen when compared with the target cost, we see that it is similar in that it has a goal to reach, but they differ in: (20: 51).

First: In terms of the method of setting the target: the target cost starts from the requirements of the customer, while the cost of kaizen depends on the profitability determined by the managers.

Second: In terms of the methods used: the target cost is used by the design team before launching the product and its readiness for manufacturing, while the Kaizen cost is used during the stages of product manufacturing. We can note that the cost of kaizen does not focus on the product, but on production processes, and most importantly focus on how to organize it at the lowest cost. Kaizen is not a one-time series of ideas nor a single reaction to the financial pressures that the organization faces, and these financial pressures help the emergence of innovation and at the same time may be a reason for many workers to fear losing their jobs, so these financial crises should be an opportunity to learn and continue in Kaizen even after The end of the financial crisis. Kaizen cost focuses on the value and profitability of the manufacturing stage for both the new and existing product. Kaizen cost activities should be part of the process of continuous business improvement with improvement in quality and product functions together. Innovation is one of the most important elements of kaizen, so it has changes for the better. Efficiency and effectiveness are two main pillars of profitability and the four main pillars of Kaizen are: the philosophy of acceptance of improvement, intellectual agreement, cooperation of work groups, and continuous learning in the economic unit.

Environmental Improvement Through Cleaner Production

The problem of environmental pollution is closely related to man as a result of his daily activities and practices by consuming natural resources, and then this continuous consumption leads to the formation of waste and causing environmental damage and disruption, which we see clearly in the industry. The main problem is that the waste increases with the increase in the population and it also increases in the proportion of per capita consumption and the worst of all is the method of waste treatment, about 10 million tons annually of fuel reaches rivers and industrial facilities generate (1) billion tons of toxic gases and ash and 70% Of the waste goes to the landfill, thus affecting human health, especially the ages between newborns and 19 years. (21:2-3). Open landfill is the main problem in affecting health and the environment, especially the air we breathe. The presence of such landfills near residential areas affects crops, animals, food products as well as water as well as odors, "which increases the activity of bacteria on biodegradable materials and with all this Incineration is added to unsanitary and illegal waste". Therefore, it can be said that the recycling of waste is an industrial process whose inputs are elements of environmental pollution waste and its outputs are new products whose basic raw materials are the elements of pollution waste.

Industrial waste is, in fact, materials of great benefit with a fruitful return and the ability to create technological progress through the recycling industry, if successful management plans for it and aware of the demands of development and pollution problems, bearing in mind that the quiet life of human beings must be given the same amount of Care is also enjoyed by modern technologies and other production processes. In addition to the pollution of these devices as a result of the practices that are carried out in modern industrial methods in relation to the transformational operations of these resources.

Environmental Management Accounting and its Relationship to Preserving the Environment: (20: 64-65).

Due to the technological development in recent years and its negative impact on human life and the environment, it was necessary to pay attention to these effects, study them and find solutions from all aspects, the most important of which is the accounting aspect because of its impact on reducing environmental costs and then on the economic aspect as a whole. The merits of the financial aspects. Environmental management accounting can be defined as environmental accounting that provides financial statements that are affected by the environmental activities of the

economic unit for the purposes of managers' internal decisions that lead to improving financial and environmental performance. It also offers a more comprehensive approach to management accounting with a special focus on costs associated with environmental issues and raw materials. There are two types of information that are taken into account in environmental management accounting, which are physical and monetary information. The material includes data of use and flow and the final fate of energy, water, materials and waste, and cash includes all environmental costs. Environmental management accounting focuses in particular on material information, because the use of energy, water and materials, as well as the generation of waste and emissions, are directly related to their environmental impact on economic units, and the costs of purchasing materials are a primary cost driver for many economic units".

There are many techniques that characterize environmental management accounting for the implementation of various purposes such as (reducing waste, following the flow of materials, reducing emissions) and others. The Japanese MOE has classified it according to the following: (23: 97).

1. The target cost with environmental awareness.
2. The cost of the role of life.
3. Evaluate the investment with environmental awareness.
4. Accounting for material flow costs.

Environmental Management Accounting and its Relationship to Cleaner Production

Cleaner production represents one of the main entrances to the inclusion of the environmental dimension in the management of production and operations, which was first proposed by the United Nations Environment Program in 1989 as a response to the demands to reduce pollution and industrial waste and under basic objectives centered on raising awareness of the concept of cleaner throughout the world and assisting governments and industry to develop programs Cleaner production, encouraging cleaner production and facilitating the transfer of clean technology. (11:184).

"United Nations Environment Program defined it in 1996 in the World Declaration on Cleaner Production as the continuous application of an integrated strategy for environmental protection applied to processes, products and services to increase overall efficiency and reduce risks to humans and the environment". (24: 161). "It was also defined as a strategy to improve productivity and environmental performance in light of social, economic and ethical considerations in terms of productivity and optimal utilization of energy sources. While environmental performance provides the basis for achieving sustainable development". (2: 188). The concept of cleaner production requires changing the orientations of decision-makers in the industry to realize its importance and financial benefits. It also requires awareness of sound environmental management and work to promote technological change. Environmental management accounting using cleaner production, which is defined as a continuous application of an environmental strategy for the optimal use of natural materials, raw materials, water and energy in the integrated production process, starting with the mitigation of gas emissions and climate change.

"Cleaner production is based on a set of practices or options adopted by economic units towards its implementation: (20: 67)".

- a. "Good operational practices: or as referred to as Housekeeping, which are the procedural and administrative measures of an economic unit that can be used to reduce emissions and pollutants, to improve efficiency and reduce costs, and these practices can be implemented in all sections of the economic units".
- b. "Changes in raw materials: Changes in raw materials lead to the achievement of cleaner production by reducing and eliminating hazardous / toxic materials that enter the production process and thus reducing the

emission of waste and pollutants. Substantive changes are introduced in the form of filtering and replacing materials".

- c. "Technological change: the changes directed towards making modifications in machines and equipment to reduce the emission of waste and pollutants, and these changes can range from simple changes that can be implemented at low costs to replacing operations that entail large capital costs such as changing the production process, modifying the design Internal equipment and machinery and the use of automation".
- d. "Changes in the design of the product: the changes that take place on the characteristics of the product in order to reduce the emission of waste during the use of the product or after its use (disposal). These changes can lead to the re-design of the product and its technical composition, which leads to a reduction in environmental impacts along its life cycle. The product and these changes take place through changing the quality specifications, the composition of the product, the reliability of the production, and the replacement of the product".
- e. "Reducing, reusing and recycling: These terms refer to preventing waste generation from its source, starting from reducing the use of raw materials and energy and reusing the waste generated from it to recycling and making it useful materials through a group of treatments, meaning the repeated use of the product through changing its original use".

"Increase in production efficiency resulting from cleaner production comes from the efficient exploitation of raw materials, including energy rationalization, and rationalization of water use, which contributes to reducing risks to humans and the environment as a result of the consequent reduction of waste and the pollution it causes, especially the reduction in the use of Hazardous materials or not using them (by replacing them with other materials). (25)".

Finding Solutions

The presence of open waste areas will directly affect human health, generating the so-called "triangle of death" area, causing diseases in the short and long term on human health, including stress, anxiety, headaches, irritation of the respiratory system and eyes, heart disease, kidney disease and cancer. (26: 1217). Because of these endless wastes, the developed world today is constantly trying to find solutions to these wastes and has begun to turn to waste prevention until zero waste is reached. In order to reach these goals, these countries tended to put taxes and bills related to environmental pollution, for example: (27).

1. Taxes and fees on emissions from large industrial boilers in Sweden (1992) and landfill taxes on waste disposal in the United Kingdom, Austria, the Netherlands, Norway, and Belgium.
2. Environmental taxes on products, which reflect exorbitant taxes on motor fuels (gasoline and petroleum).
3. Emissions rights trading/tradable licenses for industrial effluents spilled to Fox River pollutant branch in Wisconsin (USA) 1981 and the European Union Carbon Emissions Trading System used by power plants and large corporations.

APPLICATION SIDE

Through the descriptive analysis of the results of the questionnaire, which was carried out through the distribution of questionnaire papers to a number of institutions such as universities, factories and environmental departments in Al-Muthanna Governorate, where (75) questionnaires were distributed, of which (60) questionnaires were returned. The results were analyzed using the SPSS statistical program, according to the five-year Likert scale, and the results were as follows:

TABLE 1. General Information

(a)

Qualification		
certificate	number	percentage
PhD	7	12%
Master's	15	25%
Bachelor's	26	43%
other	12	20%
Total	60	100%

(b)

Specialization		
Accounting	25	42%
Business Administration	12	20%
Finance and Banking	10	16%
other	13	22%
Total	60	100%

(c)

Years of Experience		
less than 5 years old	13	22%
from 5 to 10 years	30	50%
from 11 to 15 years	17	28%
more than 15 years	0	0%
Total	60	100%

TABLE 2. The First Axis (Recycling of Waste and its Role in Reducing Costs)

Results of the Questions of the First Axis: Recycling of Waste and its Role in Reducing Costs					
Seq.	Questions	Mean	Std. Deviation	Percent	Sig.
1	Recycling reduces the consumption of natural resources in the efficient use of recyclable materials.	3.87	0.833	39%	0.000
2	Recycling is low cost, creates new job opportunities and reduces pollution	4.07	0.634	51%	0.000
3	Recycling requires incurring costs through administrative inefficiencies and the recycling rate of waste and its final disposal.	3.38	0.885	34%	0.000
4	The frequency of collection of recyclable materials affects the average cost (cost increase or cost decrease).	3.38	0.761	31%	0.000
5	There are many benefits to recycling such as saving natural resources, reducing pollution, and maintaining burial sites for waste, and this in turn affects the cost.	3.58	0.696	35%	0.000
6	Recycled materials are valuable and save virgin (raw) resources at low cost	3.62	0.804	47%	0.000
7	When disposal fees are saved and revenues are deducted from recycled resources, the costs of operating a recycling program are positive.	3.68	1.033	36%	0.000
8	Through taxes and subsidies for recycling, the optimal state of recycling can be achieved so that it is equal to the marginal cost.	3.28	1.027	34%	0.000
9	The recycling process, which includes collection and treatment, requires additional costs, but it reduces the costs of incineration and final disposal.	3.1	1.085	34%	0.000
10	Recycling reduces costs while recycling increases when the interest rate increases	2.62	1.121	25%	0.000

Where this axis included (10) questions. Through the analysis of the axis questions, the arithmetic mean of the second question (recycling is of low cost, provides new job opportunities and reduces pollution) was (4.07), with a standard deviation of (0.634), arithmetic mean of the tenth question (recycling reduces costs while the cost of recycling increases when The interest rate increases) it is (2.62) and with a standard deviation of (1.121), and this proves that there is a significant effect to prove the first hypothesis, which assumes that the recycling process reduces the cost within this axis.

TABLE 3. The Second Axis (Recycling and its Role in Achieving Sustainability)

Results of the Questions of the Second Axis: Recycling and its Role in Achieving Sustainability					
Seq.	Questions	Mean	Std. Deviation	Percent	Sig.
1	There is an important role for waste recycling in achieving sustainable development by reducing the use of raw materials from nature.	4.00	0.00	79%	0.000
2	Reducing the level of consumption of natural resources should be reduced for the purpose of achieving sustainability	4.07	0.63	51%	0.000
3	The strategy of improving productivity, environmental performance and optimal utilization of energy sources provides the basis for achieving sustainable development.	3.38	0.89	34%	0.000
4	Reducing the generation of waste and emissions and containing the associated pollutants or resulting from them in the source of their generation leads to achieving sustainability.	4.00	0.00	79%	0.000
5	The rationalization of energy, and rationalization of water use, contribute to reducing the risks to humans and the environment and thus lead to a reduction in the use of hazardous materials and their non-use and to achieve sustainability.	3.57	0.70	36%	0.000
6	Cleaner production technology is one of the techniques that are used to achieve sustainability through the production of environmentally friendly products.	3.62	0.80	47%	0.000
7	The use of resources in a wide range of production and consumption is required during the life cycle of the product and this basis is required for the development of strategies and paths of sustainability.	3.65	1.02	36%	0.000
8	Waste emitted by homes and factories is the most obvious cause of pollution, which in turn leads to urging communities to bury waste in large areas to prevent pollution, preserve the environment and achieve sustainability.	4.00	0.00	79%	0.000
9	Compliance with legislation and laws is sufficient to eliminate pollution and achieve sustainability.	3.10	1.09	34%	0.000

Results of the Questions of the Second Axis: Recycling and its Role in Achieving Sustainability					
Seq.	Questions	Mean	Std. Deviation	Percent	Sig.
10	Recycling of waste will reduce dependence on natural resources, which leads to the preservation of resources and the achievement of sustainable development.	4.00	0.00	79%	0.000
11	The process of recycling protects the environment and reduces pollution and has a positive impact to achieve sustainability and reduce waste of resources through waste recycling.	4.00	0.00	79%	0.000

Where this axis included (11) questions. Through the analysis of the axis questions, the arithmetic mean of the ninth question (waste recycling will lead to reducing dependence on natural resources and obtaining energy and waste, which leads to the preservation of resources and the achievement of sustainable development) , was (4.23) with a standard deviation of (0.427), while the arithmetic mean of the eighth question was (Compliance with legislation and laws is sufficient to eliminate pollution and achieve sustainability) it is (3.10), with a standard deviation of (1.085), this proves that there is a significant effect to prove the second hypothesis, which assumes that the recycling process achieves sustainability within this axis.

CONCLUSION

1. There is a significant impact of industrial waste recycling on the company's economic environment.
2. Recycling of industrial waste leads to reducing dependence on raw materials.
3. There is an economic and environmental return to the recycling process, as the process of recycling waste reduces the cost of production and reduces the pollution resulting from the waste collection process.
4. Members can increase contact between seller and buyer by increase the role of the intermediary and encouraging innovations like waste exchange.
5. The recycling process requires more communication and less research between the seller and the buyer to reduce costs.
6. “The identification of waste during production, its separation from the landfill waste stream, and its receipt through reverse logistic channels may not be sufficient to increase the incidence of valuable recycling”.
7. Resolving problems between companies to improve recycling or find alternative markets for inverted goods is still an underdeveloped area of regulatory practice.
8. “Institutional pressure applied particularly through the network of social ties in which the organization is involved may provide the impetus and subsequent innovation that currently limits recycling between firms in many industries”.
9. “Recycling function of reverse logistics in particular has attracted only a small amount of research interest and theoretical development”.
10. Rate of per capita production of waste is very large, as are factories.
11. The idea of recycling has existed since time immemorial and should be given more attention.
12. Legislation and laws must be enacted obligating industrial companies and other companies to commit to the process of recycling waste for the waste that results from their industrial operations.

RECOMMENDATIONS

1. That the government provide a package of tax exemptions to companies that recycle their waste at varying rates depending on the volume of their production compared to the recycled materials.
2. That the Ministry of Industry train the workers of industrial companies of similar activity on how to make the most of the recycling of industrial waste.
3. Expand efforts to identify new markets for recyclable products, and increase frequent contact between sellers and buyers.
4. Implementing recycling requires greater coordination between brokers and local, state and federal governments.
5. "Coordination can occur by discussing legislation to reduce the cost of recycling, or by encouraging recycling through purchase quotas or allowances, or by supporting the development of new products".
6. "Expanding the ability to transport increasing volumes of a commodity, and improving transportation flexibility to transport recyclable products".
7. "Providing incentives for the accumulation function".
8. "The introduction of new technology, along with improved sorting capabilities, will increase capacity, enable higher density shipments and improve performance through lower transportation costs".
9. "Increasing flexibility in transportation can improve performance through compaction at the assembly point, and reduce handling requirements".
10. "Determining cost-effective storage locations through facility site modeling".
11. "Municipalities should also investigate the most effective techniques for obtaining consumer cooperation in the collection of recyclable materials".
12. "Ability to specify recyclers or disposal options for anything other than most primary waste materials".
13. "Caught between the increased pressure to divert waste away from landfill and the lack of disposal options available".
14. Individual's reuse of the material more than once will contribute to reducing production by factories, and thus the pollution in the surrounding environment will decrease.
15. Community members must be made aware of the importance of recycling and its effects.
16. Encouraging the citizen to participate in recycling by placing machines that benefit the citizen.
17. Using waste recycling as an alternative energy as it contributes to improving the environmental efficiency of products, reducing costs, achieving cleaner production and environmental improvement.
18. Contribute to the process of disposing of toxic waste in a healthy manner at a lower cost and achieving economic returns, as well as helping to provide job opportunities and reduce the unemployment rate.
19. Recognizing the interdependence in the course of the effects of global threats such as epidemics, terrorism, organized crime, cybercrime, natural hazards and climate change, as well as economic risks, especially those related to energy sources and economic instability, with knowledge of the opportunities available at the local level down to the global level.
20. Enhancing knowledge to ward off risks and enhance sustainability while developing a flexible development structure that prevents new risks and at least reduces the severity of existing ones.

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